SCIENCE

NEW YORK, SEPTEMBER 22, 1893.

THE AUGUST STORMS.*

BY WALTER C. KERR, NEW BRIGHTON, STATEN ISLAND.

THE havoc wrought upon vegetation in the vicinity of New York city by the recent storms perhaps deserves notice, especially considering the opportunity afforded to compare the effects of two destructive gales, only four days apart. These storms though quite similar in general character differed widely in one feature, whose destructive power might escape general notice or at least be much underrated. This feature is the amount of water in the air, which largely augments the weight of the moving column and at high velocities transforms the usually harmless wind into a formidable battering ram.

Some time since Mr. William T. Davis, of New Brighton, Staten Island, mentioned that the comparative scarcity of large trees in that vicinity was probably due to high gales, and when the results of recent storms are viewed, there can be little doubt regarding this cause.

The gale of August 24 is generally credited with having uprooted or broken more trees in this locality than any on record. This destruction of vegetation was widespread. In the cities and towns the streets were blocked with fallen trees and branches while the country roads were in many places impassable. Numerous white oak and chestnut trees were uprooted that to all appearances should have offered great resistance. This storm had a comparatively low wind-velocity, and a great rainfall.

The gale of August 29th caused some damage to vegetation, though not nearly so much as that of the 24th. At sea it was one of the worst storms experienced in this latitude for years. It was characterized by a very high wind with little rain.

It may be said that the first storm destroyed the weak trees, leaving little for the second and greater one to wreck. On the other hand it may be presumed that the first storm would cause much weakening and facilitate the efforts of the greater wind that followed.

The first storm had a maximum velocity of forty-eight miles, reached by our winds about once each month without sensible damage, while the maximum velocity of the second, sixty miles, is attained less frequently than once a year and only rarely is this high rate destructive to vegetation.

The following official records from the United States Weather Bureau, N. Y., furnish accurate comparisons :

August 24, rainfall 3.81 inches from 7.52 P. M. August 23d to 8.15 A. M. August 24.

Time,	12	1	2	3	4	5	6	7	8
Wind velocity,		29	33	27	28	29	30	23	20

Maximum velocity for one hour, thirty-seven miles at 2 A. M.

Maximum rate for one mile, forty-eight miles between 1 and 2 A. M.

Between 2 and 3 P. M. August 24, the wind averaged thirty-five miles, with a maximum rate for one hour of forty-two miles. At this time no rain fell and no damage resulted.

August 29, rainfall .28 inches from 4 A. M. to 8 A. M.

Time,	12	1	2	3	4	5	6	7	8
Wind velocity,		24	31	33	38	38	44	40	32

Maximum velocity for five minutes, fifty-four miles at 5 A. M.

Maximum rate for one mile, sixty miles at 5 A. M.

At this station of the United States Weather Bureau a wind velocity of forty to fifty miles is attained once a month, a wind velocity of sixty miles is attained scarcely once a year, a wind velocity of seventy-two miles is the highest on record.

These figures show conclusively that, as ordinarily measured, the second storm was by far the greater; in fact, as the wind pressure is proportional to the square of the velocity, it may be seen that the effect due to wind pressure alone on August 29, should have been nearly double that of August 24.

When we, however, give value to the relative rainfalls, 3.81 inches as against .28 inches, the destructiveness of the wet gale of August 24 becomes apparent.

In a storm a tree must resist a column of air moving at a high velocity and to a large degree consume its energy. This energy is proportional to the mass and the square of the velocity. Dry air has small mass per cubic foot, yet at forty miles per hour yields a pressure of eight pounds per square foot; at fifty miles twelve pounds; at sixty miles eighteen pounds; at eighty miles thirty-two pounds; and at 100 miles fifty pounds. If we add to each cubic foot of air one-tenth of one per cent, by volume, of moisture, as, for instance, by partly filling it with rain drops, its weight will be nearly doubled (.0753 plus .0625), and in consequence the energy of the moving mass will be likewise doubled. One-half of one per cent of water added to the air increases the energy five-fold, and thus the wind at its maximum velocity of forty-eight miles on August 24, if burdened with this amount of moisture, would have an effect greater than a dry hurricane of 100 miles. When rain falls in calm but little water is contained per cubic foot of air, but with high winds the rainfall of a large area may be carried along nearly horizontally and massed where intercepted by vertical obstacles. It is therefore reasonable to presume that trees in exposed situations receive vastly more water per square foot of surface than is measured by rain gauges in the usual way.

When wet the resistance of foliage to passing wind and rain is doubtless increased, especially when there is a tendency for the leaves and branches to mat together on the windward side, while the weight of water carried by the tree may be a considerable additional burden.

It thus becomes easy to appreciate the enormous part which water plays in the destructive force of high winds on exposed trees, as well as on the more commonly noticed windfallen grain and corn.

*Paper read at a recent meeting of the Natural Science Association of Staten Island.

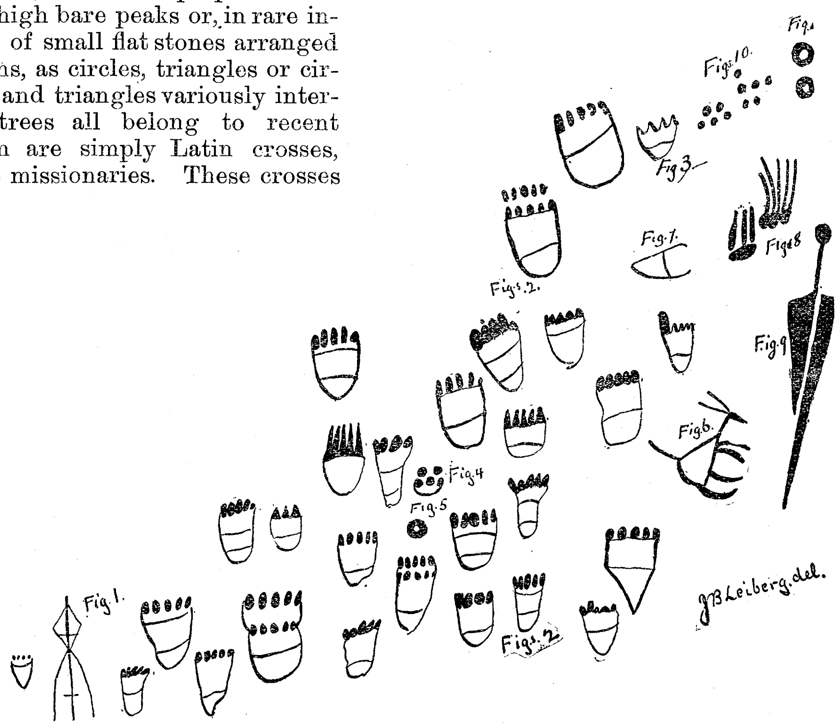
PETROGRAPHS AT LAKE PEND D'OREILLE, IDAHO.

BY JOHN B. LEIBERG, HOPE, IDAHO.

Aboriginal rock carvings or inscriptions are quite rare throughout northern Idaho. The dense forests and generally inaccessible character of the country together with a constant scarcity of natural food products furnished unsuitable conditions to sustain any considerable number of inhabitants, and those that made the country their abode appear to have been either too indolent to endure the labor required to leave any records on the rocks, or their lives did not furnish any events worth noting, in their judgment.

The records we find consist mainly of carvings on trees, or of rocks of small dimensions, raised to perpendicular positions, on the summits of high bare peaks or, in rare instances, in similar situations, of small flat stones arranged in certain geometrical designs, as circles, triangles or circles within circles, or circles and triangles variously intermixed. The carvings on trees all belong to recent years, as very many of them are simply Latin crosses, showing the influence of the missionaries. These crosses schists are rather thinly bedded, have a dip of about 85°, and the wear of the lake in former ages, when its waters stood at a much higher level, has broken the strata apart and left numerous large slabs standing in an upright position. On the face of one of these tablets of rock occur the carvings as delineated in the accompanying illustration. They occupy a space eighteen feet in length, and from two feet to seven feet in height.

There are twenty-eight figures evidently representing the footprints of the bear, three of the tracks with double sets of toes, three with but four toes, and one with but three toes. Three figures which may represent tracks of the cougar. One arrow head. Three points within circles. One mountain goat. Two sets of circles composed of five and six respectively, and three large figures of unknown meaning. Besides these figures there are evidences of many light scratches, but the lines are too dim



[Scale one-twenty-fourth natural size.

are quite common around favorite hunting or camping spots in the mountains, and appear to be made with the object in view of warding off malign influences from the camping grounds. These crosses are not to be confounded with the sign plus, so commonly made by hunters and trappers throughout the deep forests, and which merely serve to attract attention to trails, locations of traps, etc.

The raised stones, so common on high peaks, merely denote the passing of some individual, and may be quite recent or date back a long time. Sometimes white men raise these rocks. The symmetrical arrangements of rocks appear to be quite ancient. The stones composing them lie quite flat and are completely covered with slow-growing saxicoline lichens on all exposed portions. The import of these figures is unknown.

There is but one locality known to me in northern Idaho with true rock-carvings. It is located opposite the outlet of the Clark's Fork of the Columbia into Lake Pend d'Oreille, about one-quarter mile north from the shore. A rocky point of land rises abruptly to a height of 250–300 feet above the extensive marshes bordering the river at this point. The rock is a highly silicious magnesian schist, extremely hard and difficult to chisel with even the most carefully tempered modern steel tools. The to be traced with certainty. Nearly all the figures are thickly overgrown with close-clinging rock-lichens, rendering the whole quite inconspicuous. Close and diligent search has failed to bring any further inscriptions to light in the neighborhood.

One of the most interesting features in connection with this petrograph lies in the manner of its execution. The lines of the figures are not mere scratches, but are deep, wide grooves cut smoothly into this excessively hard rock, many of the grooves forming the representations of the bear tracks. Figs. 2 are 3.2 cm. in width and 1.2 cm. in depth, while the cutting forming fig. 3 is, in its broadest portion, 5.5 cm. wide and 2.5 cm. deep. The appearance of the grooves, the smoothness of the sides and freedom from signs of chipping give cause for the belief that they were cut into the rock by friction and not by chiseling. A piece of wood properly shaped and constantly charged with water and sharp sand could be used to cut such grooves, while the same manner of tool rotated by a bow would cut round holes such as make up fig. 10. Will some of the readers of *Science* acquainted with the methods of the aborigines in making their rock inscriptions, inform us if such tools were in use elsewhere for doing this kind of work and the meaning of this petrograph?

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CORN CANE.*

BY F. L. STEWART, MURRYSVILLE, PA.

MUCH attention was given to the physiological affinities of maize to discover, if possible, whether in the case of any other of the solid-stemmed grasses with which it naturally ranks, a similar correlation exists between seed development and the accumulation of reserve materials in the culm, with cane sugar as the principal ultimate product.

In this connection, it became a point of especial interest to determine what the deportment of sugar cane and sorghum would be under like conditions, and accordingly the investigation was extended to them, along the same lines.

It was soon found that a comparatively new field had been entered upon and that no progress could be made without constant appeal to the microscope and approved methods of chemical analysis for the correct determination of many important questions requiring solution. Thus, some safeguard was established to prevent false analogies from being followed and false conclusions reached, such as have marked and marred the whole rationale of treatment, both of the beet and of sorghum, in the attempt to make sugar manufacture from them practicable in this country.

It was found to be the fact, uniformly, that from the time the sugar first shows itself in the cell sap, during the early growth of maize, until the grain begins to harden, it steadily increases. But what is most remarkable is that it then suddenly diminishes and disappears, leaving behind it scarce a trace of its former presence. Other allied plants, such as sorghum, up to a certain period of growth, manifest the same characteristics, but beyond that the resemblance ends. Sorghum does not reach its full saccharine strength until its seed is dead ripe. Maize, on the contrary, if its grain be allowed to pass into that condition, parts with its sugar utterly, but if the offered alternative be taken and the ear be removed promptly at the critical period, all the vital energies of the plant become at once directed to the special work of storing up highly organized food materials in the cells of the stalk. Instead of dying, off hand, as it does in the other case, the plant *lives on*, and without a break the constructive forces go on converting the simpler into the more complex reserve materials. The stalk is their storehouse, and, under the new conditions imposed, that part of the plant passes through a supplementary stage of development. Its principal function then is to accumulate sugar.

It would be out of place, in a brief sketch, to particularize the changes then occurring, further than to say that the other carbohydrates, generally, give place to sugar. There is also a sensible increase of the protein substances keeping pace with the increase of the sugar.

It is then a process of *juice ripening*, borrowing the term from an analogous process which is carried on in the maturing joints of the sugar cane. This led to a closer comparison of the latter with Indian corn when in this anomalous condition. Living ribbon cane from Louisiana, received here fully matured and in perfectly good condition, and young joints at hand growing under glass, furnished ready means of comparing them closely under all ordinary conditions of growth and development. It is very evident that the two species have then several characteristics in common which are not evident when the cane is compared with corn in what we call its natural condition. The following have especial significance, as they approach maturity.

1. In both plants the solid stalk or culm has then become simply a reservoir of materials available for plant food, and in the case of the sugar cane, made use of when active growth by the joints begins.

2. In both, the development of the organized products is progressive, *i. e.*, from the more simple to the more complex of the series, which take the soluble form and are available for transmission to any points where new organized structure is to be built up.

3. By reason of the constant accumulation of these soluble materials, chiefly, the weight of the plant and the density of the juice increase.

4. The general plan of structure and physiological properties of the stem in both are very much alike, although there are very striking differences, and they become more alike, both in structure and function, as this period advances, the separate joints of the one and the whole stalk of the other attaining their full size before the highest elaboration of their juices takes place.

5. It is a well-attested fact that ordinarily no variety of sugar cane is known to perfect its seed or, to use the language of May, "to produce anything like seed, either in India, China, the Straits of Malacca, Egypt or the South Sea Islands." By a curious analogy maize, in this secondary stage of development, is likewise incapable of producing seed, having lost, apparently, its capacity in that direction.

There are other points of resemblance which it would be interesting to note, but that to which the most importance attaches in this connection is the highly saccharine condition of the juice in both, which ranks them together more closely than their striking natural relationship otherwise would seem to justify.

The reader is referred to the table in which the average sugar percentage of both is given as based upon the most recent and reliable analysis. It will be seen, I think, that the term *corn cane* has not unreasonably been applied to a plant which in a summer's growth can thus be made to develop qualities which give it a rank second only to the tropical cane.

Also, it will be observed that the saccharine qualities of the juice, only, have been compared in the table.

But, as between the other sugar-producing plants named and Indian corn there can be no further comparison. Maize is a cereal of the highest value, and it does not lose that character in this case. The high *condition of sugar development which it can now be made to attain is not attended by the sacrifice of the grain*, and against this grain product neither the sugar cane nor the beet can show any compensating value whatever.

This fact cannot be discounted by the assumed inferi-

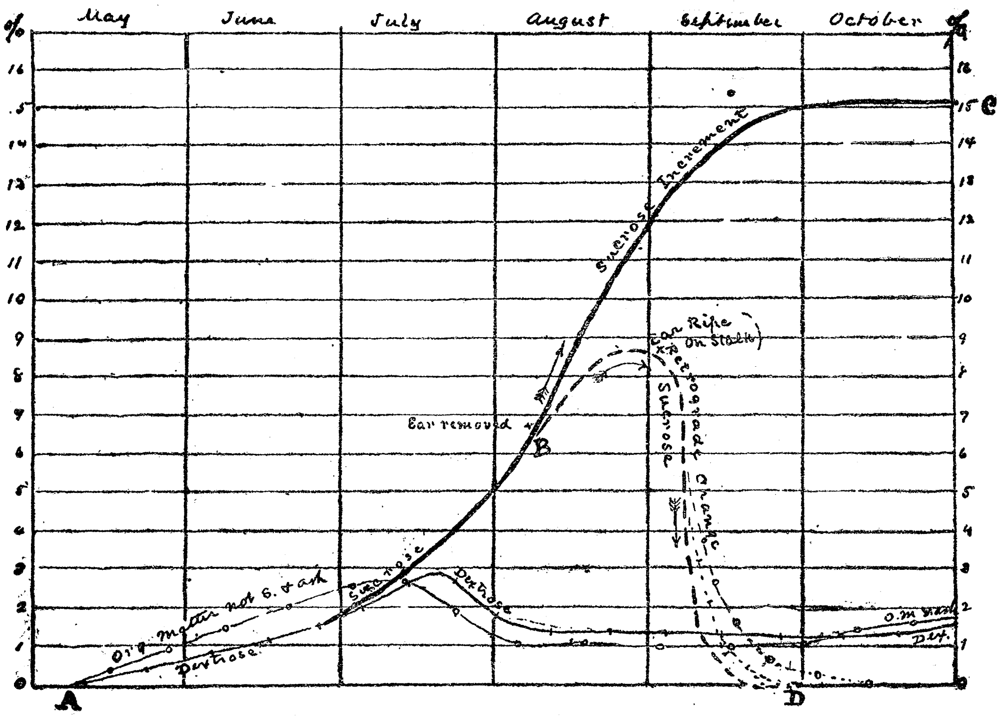
*Continued from Science, Sept. 15.

ority of the corn grain when harvested at the time at which it is necessary to arrest its development to secure the sugar crop. Fifty years ago it might have been necessary to argue that point, but within that time the corn canning and drying industry has arisen, and immense quantities of American "sugar" corn are now put upon the markets both of this country and of the old world in response to the demand for the immature grain, and within the last decade the same product from "field" corn, along with the green fodder, cured by the ensilage system, has won an established value as the best form, the most nutritive and most readily preserved without loss, in which the whole plant can be utilized for stock feeding.

This plant is capable, then, of yielding its grain in one of two widely different conditions, as widely different in fact as if they were the product of two different species. Ripeness may be affirmed of either, if by that is meant,

It does not detract from the value of our ordinary field corn in this connection that its immature grain cannot be used to the same advantage for canning or drying as that of the so-called sweet varieties. The peculiar softness and sweetness of the grain of the latter has practically nothing to do with the amount or quality of the saccharine secretion in the cells of the other parts of the plant. In fact, the plants with the richest juice are the tug-stemmed field sorts; the dwarfage of the varieties grown by the truck gardener and for canning comes from selection to produce extra early ripening, and the small size of most of these will exclude them from use where sugar manufacture is the object.

But the grain of field corn taken in this connection will serve its highest purpose for stock feeding. As will presently be shown, it has a distinct and superior value to the hard, full-ripened corn, for this purpose. Systematic experiments made within the past few years at different



DIAGRAM,

showing approximately the composition of the solids in the juice (sucrose, dextrose and organic matter not sugar and ash) during the life of the plant.—A. B. C. from planting to final ripening of juice.—A. B. D. from planting to full ripening of grain.

first, the possession by the grain of germinative power, for both will grow, and, second, a developed condition of the nutritive elements far enough advanced in the grain at either stage to fit it in the best manner for certain special uses as food.

We can have either condition of the grain at will, and our ability to secure either gives us a variety in the choice of food from this single source not approached by the products of any other plant. We have the option between two series of food products widely different, derived simply from one kind of grain taken in two different and successive stages of development.

We elect to take it at the earlier stage, when we propose to produce sugar, and our taking it then is the one condition upon which the proper juice-ripening in the cells of the stalk depends. Two crops are thus secured from the same plant, instead of one, the interval between the maturing stages of each being long enough to enable both to be properly cared for without loss.

state agricultural stations in this country, and by practical farmers, stock growers and dairymen, not only prove this conclusively, but indicate beyond question what is the best means of curing and preparing it for use as animal food. I refer to the ensilage system, in the practice of which Indian corn is almost exclusively used.

As is well known, wherever it is grown for this purpose to the most advantage the aim is to secure the most luxuriant growth, and the fullest development of the whole plant up to the time when the grain is fully formed, but still soft. Under such circumstances the ear composes a large proportion of the prepared silage, twenty-five to thirty-five per cent.

It is no part of my present purpose to discuss a point which just here demands special notice, namely, the richer quality and higher value of corn silage attainable by modifying the system so as to take advantage of the full development of the food materials within the plant, upon which, as already shown, its value in sugar produc-

tion entirely depends by harvesting and pitting the ears at the usual time, and the fodder at a *later* period. As shown (in the table) there is a large increase of the substances containing nitrogen, as well as the carbohydrates under the new conditions. The special bearing which this, as well as other facts which cannot here be particularized, must have in modifying the existing system of stock feeding, either by ensilage or dry fodder, is hardly second in importance to its relations to sugar production.

Also, it should be noted in this connection that it is now found that corn fodder, cut after the last stage of the ripening of the grain has been reached, is subject to great loss of nutritive matter.‡ The destruction and disappearance of the soluble carbohydrates follow in that case as inevitably as their preservation and increase do after the removal or arrested development of the ear.

Except the trimmed stem, every other part of the plant will go to the silo, when sugar production is the object, and the resulting food products will be as much richer than ordinary ensilage in all the elements of nutrition as the larger proportion of the grain to the whole mass, and the more highly elaborated juices of the tops and leaves enter into it.

(To be continued.)

‡This is an invariable result, and it sufficiently reveals, I think, the source of the hitherto unaccountable loss of solids reported as occurring during the curing of corn fodder.

About three years ago Prof. W. A. Henry, of the Wisconsin Experiment Station, called attention to the results of tests made there to determine the amount of dry matter in green and dry corn fodder; which showed that the cured fodder lost not less than twenty per cent. of its dry substance before it was fed out as compared with the dry matter in the same fodder when it was cut down green in the field. The fact of the loss was well attested; but it was practically discredited because no sufficient cause could be assigned for it.

But in 1881 Prof. Geo. A. Cook, of New Jersey, had noticed a loss of dry substance in corn fodder under similar circumstances, and that the loss fell almost entirely upon the soluble carbohydrates. (N. J. Expt. Sta. Report for 1882.)

Prof. E. H. Farrington, of the Illinois Station, records a decrease, not definitely accounted for, of 17.3 per cent of dry matter in the whole plant cut and analyzed two weeks after the ripening of the grain. ("Science" April 15, 1892, p. 212.)

NATURE AND DISTRIBUTION OF NEW YORK INDIAN RELICS.

BY W. M. BEAUCHAMP, BALDWINSVILLE, N. Y.

WHILE Indian relics are almost unknown in some parts of New York, in others they are abundant. Forts, villages and camps are often found far away from lakes and rivers, for security from enemies was an important consideration, and when villages were established there was often regard to the fertility of the soil. As this and fuel failed, removal become necessary, but almost invariably the red man of New York placed his lodge on sandy ground. In a general way, however, the relic hunter will seek the banks of rivers and streams, especially at fords and rifts, with the best hopes of success. Hunters, fishermen, and traders have there left the finest articles.

He will soon learn that all sites are not alike, some noticeable things rarely, if ever, appearing with certain others. By close examination and comparison he may sometimes establish a sequence of sites, or discover relations between those far apart. He will be blind indeed if he does not soon see plain evidences of aboriginal travel and trade. He will learn one curious fact, that, in the larger part of the Empire State, the finest stone implements are among the oldest. With ample material for illustration before me, this paper will simply deal with the character and distribution of Indian articles in New York.

Chipped Implements.—Arrows, spears, knives, perforators, scrapers, and other articles, are quite generally found, and of all the usual kinds. A drab-colored hornstone is the most common material, but there is a great variety of others. All colors of jasper will be seen among these, with quartz, chalcedony, argillite, limestone and sandstone. White arrows are more prevalent in the eastern part than in the west, and some sites afford local and unique forms. Although hornstone is abundant in the long Helderberg range, much of the material was brought from a distance, and cores and chips occur abundantly far from the quarries. Caches of unfinished implements are frequently found, usually of one form and size, and between two and three inches long. I know of no form of arrow, knife, or spear ever described, which I have not figured from local specimens. Some are unique. Three of my arrows, above the notch, have the outline of the gable end of a house, with perfectly straight edges. Some triangular forms are almost as slender as a flint perforator.

Scrapers occur in great variety, and of as varied finish, but they are lacking in many places, as the Iroquis and some others did not use the stone scraper and drill. Neither need be looked for within earthworks and stockades. The leaf shape, combining the knife and scraper, is common. Mr. A. G. Richmond found scrapers with serrated edges at a fishing camp on the Mohawk. They were small and rare. I have found other forms from small to large sizes. Sometimes they are curious. One, of green jasper, long and nearly triangular, has a knob at the top, as though for suspension, and projecting points on either side of the broad base. Another rare form is sabre-shaped, the concave side being the scraper, and the convex, a knife. Flint perforators are often very fine, and vary from the simplest forms to those quite complex. Some are of very great interest. Flint hammers occur, and some very small flint disks a friend has called gambling flints. Rarely a hornstone celt has been slightly ground, but rude celts of sandstone are often chipped.

The flat sinkers, or quoits, are also chipped implements. They are sometimes quite large, and found near water,—sometimes in it. Usually they are between a rectangle and circle, often with notches on the four edges. I have found them, however, miles away from any fishing place, aud think they were often used in games. The smallest form I have resembling these, is polished, circular, about an inch across, and with two notches cut on opposite edges. Larger oval pebbles are found grooved for anchors. About Cayuga and Seneca Lakes, smaller grooved pebbles are abundant, about the size and form of a hen's egg.

Hammer stones, so called, are of endless forms, and of many uses. Like the preceding, they were in use quite recently. I have seen one on which a figure was inscribed with compasses. They may have one or more pits on one or both sides, or on every face on which there is room. The edges are not always hammered, and sometimes circular ones have been changed into chungke stones.

The grooved stones, used by the Iroquis about the beginning of the seventeenth century, are peculiar to their territory, thus far appearing in that of the Mohawks, Onondagas and Senecas. They are bowlders, in which appear one or more wide, straight and uniform grooves, finely striated from end to end, and are supposed to have been used in arrow making. This may possibly have been.

Occasionally finely polished pestles appear, but most of those along the Seneca River are merely long pebbles, showing use, and sometimes polished. Generally they are slightly chipped, and sometimes squared. Rarely a pit is made near one end. The Iroquis used, and still use the wooden pestle with double ends.

Polished Stone.—There is a gradation of chipped articles into those which are polished, often by an intermediate picking. Celts and gouges quite frequently show this. A pebble was first chipped into a form that might be used. Then it was neatly picked, at leisure moments, after being sharpened. Still in use, the final polish was given, as time allowed. The result is that rudeness of implements is no certain sign of age. The finest and rudest may lie side by side, and were used together. Every form of the gouge and celt is found in New York, from the very smallest to the largest size, and the materials for both vary from the poorest to the most elegant. A frequent local form is quite angular, having six faces, one of them very broad. Those of striped slate flare, like the white man's hatchet. The long, tapering gouge is the most common, but there are several broad forms.

Allied to these is a long stone article, rare, and mostly found in Onondaga County, which much resembles a butcher's steel without the handle. An Indian friend said the old men told him that they formerly used such a stone, with a bow-string, in making fire. It seems too frail for other uses.

Mullers, polished on one or both surfaces, or combining the hammer stone, seem of early use. Allied to these are the large bowlders, on which tools were sharpened, forming shallow depressions; and the smaller stones, plainly used as whetstones. The so-called sinew stones are rarer, but were of recent use.

Every form of stone tube is found, and almost throughout the State, but most abundantly in central New York. It would require too much space to describe the many interesting examples, some of which are of striped slate. The largest and most remarkable are of sandstone and slate, and were found on Lake Champlain, the Mohawk River, and Otisco Lake. The shorter ones are drilled from both ends; the longest from one. Some unfinished ones have been found.

A large ceremonial stone, of my own, plainly shows its mode of making. It is of a hard, light green stone, and has been picked into a form like that of a double hatchet. Polishing was then begun, and a little was done at this. Then drilling began with a tubular implement, resulting in a shallow circle, enclosing a core. There the work stopped. No form of these ceremonial stones has ever been figured which does not occur in the central part of the State, but all such things are rare in the Mohawk Valley, which travellers avoided, and where for ages no man lived. Along the great lakes, and the St. Lawrence, they are often found. While all finished articles of this kind are perforated from top to bottom, I have seen but one with lateral holes, when unbroken.

A curious little thing I picked up by Onondaga Lake. It was a small cup of sandstone, about an inch across, and perforated through the bottom. The form was nearly that of a coffee cup. One similar was found in California, and they seem to have been pendants. Quite rarely small and pretty cups or bowls of striped slate appear. In other materials they are more common. Along with these may be placed the well-known potstone vessels, usually with projecting handles. Fragments of these are abundant in many parts of the State, usually perforated, and often with a secondary use. Of course they were imported, and are found only by navigable waters. They were not used by the Iroquis, nor do they occur in connection with brown earthen ware. Many sites have no traces of any kind of vessel, and it is quite possible the hearthstones, so conspicuous in some places, may have been used in heating water in vessels of bark. These stone hearths were not customary with the Iroquis, but they dug holes in the ground for their fires, so that recent relics are often deeply imbedded. Depth has little to do with antiquity.

The half-circular polished slate knives are of general occurrence, but those with a thickened back are rarer than the simpler form in New York. Another polished slate knife is locally termed a slate arrow, being barbed, and with a similar outline. These vary much in shape, size, and material, being sometimes very delicate. As far as known, they seem confined to both sides of Lake Ontario, the St. Lawrence, and Lake Champlain. A number have been found in Canada, but they are most common near the Seneca and Oneida Rivers. They have curving edges, and were used with a handle.

Stone plummets are also somewhat local, but often of fine finish and quite variable design and material. Most of them have been found about the lower ends of Oneida and Onondaga Lakes, but they have a general resemblance to those of Ohio. Gorgets, variously perforated and formed, are scattered all through the land, from the Atlantic to the Pacific, and yet their use has not been determined. They are often of fine forms and materials. Between these and the bird-shaped stones is another class of perforated articles, somewhat pyramidal in form, and sometimes with a nipple at the top. These are comparatively rare; quite as much so as those called boat-shaped.

The bird amulets belong almost exclusively to the country drained by the great lakes, though they have been sparingly found in New England and New Jersey. Some very odd forms occur. The simplest is almost a bar, always with a sloping perforation at each end. A more common form is narrow, with a raised head and tail. Others are quite broad, with projecting knob-like ears; and similar ones are quite flattened. I have figured many of these in New York and Canada. They are usually of striped slate, and most abundant on both sides of Lake Ontario, where they are sometimes very large and fine. They may have been fetiches. Another article of slate is long and triangular, like a bayonet.

Among the ruder implements are balls, ground or chipped into facets, or with grooves for use in war clubs, but many minor articles may be passed over. Not so the pipes of stone, of which the larger part of New York specimens are comparatively recent. Until the coming of the whites most New York pipes were of clay, the Naragansetts making those of stone, but with the use of steel tools stone advanced in use. Some early examples of such pipes are found, a few of them unfinished. Platform pipes, like those of the mound builders, are hardly rare west of the Mohawk Valley. Catlinite pipes may be called modern, as that material seems to have been almost unknown in New York until near the close of the seventeenth century. By that time ornaments of red slate and pipestone became quite the fashion. The former abound on most recent sites, and are often quite tasteful.

Copper Articles.—Many fine examples of native copper articles have been collected, some very large, but the socket for receiving a handle is rare in these. They are of early date. When the whites came, brass, copper, and bronze became the rage for use and ornament; with a fair allowance of iron, pewter and lead. Many things were made on the spot, and shreds of sheet copper occur on most Iroquis sites. Pieces of this, finely notched, supplied good saws; cut into triangles and perforated, it made good arrows; rolled into cones, it furnished bangles, while more elaborate ornaments came in other ways. Not far from A.D. 1700, silver replaced bronze for ornaments and has but lately gone out of fashion.

Shell, Bone, and Horn.—Early articles of shell are quite rare in the interior of the State, though occasionally found. I have not seen half a score of shell articles that could be safely placed before A.D. 1600, leaving out the Unio shells found on so many early sites, and which were rarely worked at all. Of shell beads, used in belts, the

Iroquis probably knew very little until they had them from the whites. In the eastern part of the State the case was reversed. Small shell beads, made by Indian and not by white methods, are quite rare. They are drilled from both ends, and I have seen very few. In Cayuga County, however, some very large beads have been found which may be early. All known wampum belts are modern. Once introduced, the Iroquois used beads lavishly, and recent gorgets, beads, and ornaments of shell are frequent. Bone and horn were used earlier, and were favorite materials with the Iroquis. Ornaments made of perforated skulls appear in Jefferson County, and carved bones and horns in other places. After the Iroquis obtained knives and saws they did some tasteful work in this way. Quite handsome combs were made, usually symmetrical. Some unfinished examples show how they were made. Just before European trade vigorously commenced, they formed a few barbed fish-hooks, but I have known but four of these. The hook with the knob, but without the barb, is earlier, and quite rare. I think the barb came from a knowledge of the white man's hook, especially as one of these was from a place occupied about A.D. 1600. The four hooks were found respectively in Canada and Jefferson, Madison and Onondaga Counties. Harpoons of bone or horn are mostly recent, though not invariably. They were used by the Iroquois. Recent ornaments of bone are conventional or realistic. Mingled with them are Venetian, porcelain, and glass beads, and all kinds of trinkets. Jesuit rings have a prominent place.

Earthenware.—Most villages, and many camps, have afforded much earthenware, occasionally found entire in graves. Vessels are sometimes quite large, and often beautifully ornamented with dots and lines. Pottery is valuable in connecting sites. On a few vessels, three or four dots inside of a diamond or triangle, suggest the human face. Human faces or figures at the angles of earthen vessels, were in fashion among the Onondagas and Mohawks late in the sixteenth and early in the seventeenth centuries. The fashion lasted about thirty years, but this absolutely fixed the age of two important sites. These figures also have peculiarities connecting them with other styles, and are usually symmetrical, but in one Mohawk example one hand is raised, and the other turned down. Pipes often suggest a similar connection, or reveal striking individuality. A series of curious many-faced pipes from one neighborhood, could have been made by only one man, and others, far apart, have a similar personality. Raised figures are common on Iroquois pipe bowls; but in the earlier ones they face the smoker, in the later they are turned from him. In one instance a spirited panther's head is turned to one side. This was from a grave of the transition period, which had another with an eagle turned from the smoker. Pipe stems are often ornamented with lines and dots, and others have projecting lines running along both sides. The variety is endless. The English freely distributed the common white pipes, and they appear on most recent sites. Sometimes they are found of pewter, brass, or iron.

Among modern pipes I have an Indian one made from an immense deer's antler, which is well carved, and was finely painted in its day. Detached ornaments of terra cotta are sometimes quite artistic, and may represent the whole or some part of bird or beast. Such things must be looked for only in cemeteries or villages. It is a mistake, however, to expect relics in all graves, for scores of early tombs have been opened which had no trace of any article. Equally erroneous will it be to look for fixed modes of burial. They varied greatly within a limited space and time. One occurs to me where a young person of distinction was interred head downward.

Some of the finest articles have been found at a distance from villages and camps; often in low places, as though lost in hunting or war. This reminds me that the common opinion that broken implements necessarily indicate battle fields, is another error. In villages they were often broken accidentally, but in the great New Year's feast of the Iroquois and Hurons, wholesale destruction might be a matter of course.

I have seen a few beads of baked clay, as well as of stone. The latter are formed from fossils. In one case, in Cayuga, a fossil shark's tooth had become an arrow, and curious stones have often been slightly worked to increase a primary resemblance. A few counters of bone or clay —the latter sometimes made from broken earthenware—have been found on Onondaga sites, probably used as in the peachstone game. In this game, of course, other materials were at first used; perhaps the deer buttons which are not yet laid aside.

It may be remarked that while knives and punches were used in decorating vessels, some ornaments were formed simply by pinching the clay on the sides of vessels, and on some fragments the impression of the thumb and finger plainly remains. Traces of basket work are rare.

SARCOLOGY: A NEW MEDICAL SCIENCE.

BY WALLACE WOOD, M.D., PROFESSOR IN THE UNIVERSITY OF THE CITY OF NEW YORK.

The recent experiments of Brown-Séquard and Dr. Hammond in injecting extracts of flesh into the blood, go to show that there may be a science of the organism, which is neither anatomy nor physiology, nor yet histology nor chemistry, and yet which may be founded upon facts and laws as sound as those upon which are based its sister sciences.

The elements with which chemistry deals are atoms and molecules; histological elements are cells, fibres, membranes and tissues; anatomy describes organs and systems; while morphology conducts the mind to higher combinations, such as antimers and metamers, the person, the couple, and the colony, the individual, and the race.

Sarcology discarding all forms and tissues, comes down, as it were, with blows of the hammer upon the solid and naked flesh, driving it down to a hard basis. It reduces this flesh to pulp, and with such pulp seeks to reconstruct the organism. In Brown-Séquard's laboratory we have brain juice and testacular juice; from Dr. Hammond we receive scientific elixirs of life labeled Cerebrine, Cardine, Teotine. Inject these into the river of life, the *milieu interne,* and each goes to its proper part and reconstructs it.

How many kinds of flesh are required to make man? Four; one for each kind of life force. One to bear the strain of each of the cardinal forces, excitation, motion, growth, production.

These forces work through nerve, muscle, vessel, and gland.

These powers are radical or elementary. In organic life there is a nervous or excitative tendency, a muscular or motor tendency, a vascular or tubular tendency, which is toward nutrition, construction, growth, and a glandular or epithelial tendency, toward efflorescence, effusiveness or production. Nerves are the agents of excitation, muscles are motor agents, tubes are the agents of construction, glands and parenchymes or epitheliums are the agents of effusion, efflorescence and productivity.

The science of sarcology rests upon the foundation of the four radical parts of the organism, the four elementary kinds of flesh. If any one is in doubt concerning the doctrine, let him dissect the serpent, a vertebrate comparatively simple, and the one best generalized. I

have spent two summers in this kind of work and have found it most profitable.

Examine the serpent in the embryo first. One easily defines four long lines thus:

1——————
2——————
3——————
4——————

The first is a white line of nerve flesh, the second a livid line of muscular flesh, the third a red line of vascular flesh, and the fourth a yellow line of glandular flesh.

In the adult these four radical elements appear also in long lines, and one forgets to look for details of organs and functions, for he sees before him a grand generalization made by nature herself. Here is the long white line of nerve, the flesh of excitation, next a gross elongate contractile mass, say three feet in length, the motor flesh, two long tubes, one alimentary the other sanguiniferous, nutritive tubing, constructive flesh, and finally a chain of elongate soft masses, each serpent-shaped, lung, liver, kidney, ovary, constituting the effusive or productive flesh.

Each of these being reduced to impalpable powder, if made into extracts, we would have serpent neurine, musculine, vasculine, glanduline.

Presumably we must take it for granted that the flesh of the serpent is not appropriate for human veins, as we do not put it into the human stomach, though we do that of the turtle, but the simplicity of the organism makes it a most delightful subject for the man of science to contemplate. Along that white nervous line lies the brain, the soul, the spirit of the creature, the power of excitement; by theory injected into the veins of other creatures it ought to raise the spirits and the power of excitement. Along the livid contractile line lies the muscular power. In the third, or vascular line, we find the heart and the vitality. Injection of this flesh should increase vitality, the power of living and growing,—a serpent, like a cat, dies hard. The heart and intestines of felines also offer a subject for investigation. In the fourth line, finally, that of the soft and melting flesh, we see the force of effusion and efflorescence, or productivity. Forced feeding of the veins or lacteals with this flesh ought to raise the effusive and productive power.

For purposes of experiment the rabbit would in many places be a more convenient animal than the guinea pig of Brown-Séquard. A number of these animals being provided, the brain and nerves are thrown into the first pile, so to speak, as spirit flesh, the muscles into the second as motor flesh, the heart, veins, arteries and intestines into the third as vital or vigor flesh, and the lungs, liver, kidney, ovaries, testes and mammary glands into the fourth as productive flesh.

These four radical parts being treated by Brown-Séquard's method would produce nerve juice, muscle juice, vessel juice and gland juice. Being treated by Dr. Hammond's process with boric acid, glycerine, and absolute alcohol, the result would be four radical or elementary extracts, neurine, musculine, vasculine, glanduline, calculated respectively to raise the spirits, the energies, the vigor or vitality, and the effusive power.

Each of the grand divisions of the little kingdom of man has its capital or seat wherein each special kind of force is concentrated. The nervous centre is the cerebrum, or highest pair of nerve ganglia; the muscular centre, somewhat less marked in man, is clearly to be distinguished in the breast of wild birds, and in the rump of the cervidæ; the heart is the vascular centre, the seat of vitality and vigor, the culmination of nutritive force; while the germ or sperm glands, or generative flesh, may be regarded as the glandular culmination of the organism.

In these organs, then, brain, breast (of birds), heart and ovaries or testes, we have special concentrations of life's radical forces, excitatory, motor, constructive and generative, and thus, if instead of taking the whole of the flesh for the manufacture of carneous extracts, one selects the concentrated parts, using these alone, he will, in place of making neurine, musculine, vasculine and glanduline, produce cerebrine, pectine, cardine, testine, which thus ought to be a higher essence of the flesh. For these specialized flesh masses in nature present to us the highest examples of force excitant, energetic, constructive and generative.

How to grasp and bottle these forces and with them perform the scientific miracle of transubstantiation, is the question for those who seek an elixir of life, making these flesh masses by means of extracts the vehicles through which to transfer these forces from animals to man.

The ancient Romans were convinced of the truth of the dictum that each part nourishes a part. As an example the udders of cows were eaten by them as emotional food. The science of sarcology and the new way opened up by Brown-Séquard and Dr. Hammond suggest higher possibilities. Who knows but some day we may inject into our veins the breasts of birds and the heart of the lion, as modes of raising human spirits and energies.

HISTORY OF SCIENCE IN AMERICA.

BY JOHN READE, MONTREAL, CANADA.

The period between 1876 and 1889—the centennial period, it might be called—was the occasion of many retrospects, touching the development of letters, law, the constitution and various branches of science within the Republic. Long before the later limit of this period had been reached, the eyes of students had begun to contemplate, with admiration, an anniversary of still more pregnant suggestiveness, and surveys covering the interval between the Columbian discovery and the present have begun to appear. In an age of specialists, such as ours, comprehensive records of progress, like those of Drs. Whewell and Draper, are going out of fashion. Where they survive, they mostly take the cyclopedic form, each contributor dealing with a special department of knowledge. If we were to have a history of scientific progress in the new world during the last four centuries, it would probably be the product of such collaboration.

In compiling such a history, it would be necessary at the outset to draw a line of partition between such scientific research as, though conducted on this side of the Atlantic, was due to European initiative. In geography, for instance, the services of Columbus belong, in the main, to Europe, and of European countries, Spain has the best claim to the honor of them. But where, after his primal discovery of cis-Atlantic land, he chose fresh starting points for exploration and thus enlarged his knowledge by its growth on American soil, America may at least share in the distinction. Again, whatever additions to geographical knowledge or natural history were made under the auspices of viceroys or governors after the settlement and political organization of the West Indies and of South, Central and North America, may fairly be set down to the credit of American science. What is not American is Spanish, French or English, or less frequently, Portuguese, Dutch or Scandinavian.

The gathered facts which, after due sifting, amendment and classification, might be accepted as of scientific value, relate to geography, geology and mineralogy, meteorology, botany, anthropology, philology, mythology and folk-lore. Some of these terms were not in use in the early generations of American settlement; nor of science, in our modern sense, was there, apart from pure mathematics, and

its applications, a great deal that was worthy of the name. The germs, however, were there, and the scientific method of to-day sometimes makes them fructify in ways that the authors never dreamed of.

The materials for a history of the sciences in America are ample enough. If we have regard to any one of the three main divisions of the twofold continent as occupied by Europeans—New Spain, New England and New France—we happily find that, in every instance, among the pioneers, there were educated observers who, although their mental horizon was contracted by prejudices characteristic of their time, country, creed or party, or all conjoined, were able to express their thoughts in intelligible and often in vigorous language. In some cases these scribes, priests for the most part, though sometimes laymen, have given us their impressions of the aborigines with whom they came in contact. A few of these latter—or at least half-castes—had also learned the accomplishments of the new-comers and have left us what purport to be traditions of their race. It is also of importance, for the subject under consideration, that the most learned and enlightened of the conquerors won the sympathy of the natives, and, although their treatment of them was not always such as science would approve, they nevertheless elicited from them information that science can turn to advantage. If we seek to know where the materials for the history of scientific progress in America may be found, it is enough to mention Mr. Justin Winsor's History. The critical essays on the sources of information in these eight volumes will, if wisely used, guide the inquirer along the path by which science, in all its branches, developed during the first three centuries of civilized life and labor in the new world.

A beginning of such an investigation for the northern part of the continent was made a few years ago simultaneously by two members of the Royal Society of Canada. Singularly enough, though one (Professor Laflamme) is a geologist, and the other (Professor Penhallow) is a botanist, they both chose the same line of inquiry—the progress of botanical research in Canada. Professor Laflamme made a single savant (Michel Sarrazin) the centre of his study, while Professor Penhallow undertook to trace the successive steps by which plant lore was developed in Canada. Although in each case the ground, both biographic and historic, was virtually unoccupied before, each winter succeeded in clearing a considerable tract for the benefit of the historian of science. The scientist trained in the methods of the present meets, in such surveys of the past, with much that makes him smile, much, perhaps, that tries his patience, but occasionally he discovers an anticipation of knowledge long ascribed to later workers. Sarrazin was a pioneer in comparative anatomy as well as botany, and his observations were highly esteemed by the French Academy of Sciences. To-day he is chiefly remembered in connection with the order of polypetalous exogens (*Sarraceniaceæ*) that bears his name. Another botanical name due to a Canadian scientist of the French regime is *Gualtheria.* Again, *Diervilla* was the name given by Tournefort to a species of bush honeysuckle, out of compliment to Diereville, who wrote the "Voyage du Port Royal de l'Acadie." Kalm, whose assiduous services to science in North America are commemorated in *Kalmia,* spent considerable time very pleasantly with one of the most learned of the governors of the old regime, De Galisounière.

If we begin with the "Voyages de Decouverte" of Jacques Cartier, recording impressions made on an explorer of the days of Francis the First, and follow the course of settlement, organization and research down to the time of Kalm's visit, soon after the publication of Charlevoix's history, we are not likely to miss frequent indications helpful to the historian of scientific progress. Sir William Dawson's "Fossil Men" is based on the discovery of remains on the site of the Indian village of Hochelaga, which, after an interval of nearly three centuries and a half, confirmed the truth of Cartier's hitherto unsupported story. A few years later the astrolabe of Champlain was found in the track of his journey to the *Mer Douce,* not far from the banks of the upper Ottawa, a prize for more than the antiquary. Faulty as he is, when judged by the rigorous standard of modern science, Champlain has left us, in his writings, a rich mine for the student who would compare things old with things new. In his rough, practical way, he was a watchful observer, and if his handling of the pencil is clumsy, he uses his pen for the most part with clearness and point. In the very year of his death, just a century after Jacques Cartier's visit to Hochelaga, there was published at Paris a book entitled *Canadensium Plantarum Aliarumque non dum Editarum Historia,* by Jacobus Cornutus (Jacques Cornut), whose share in the development of the knowledge of new-world botany is the subject of a paper read by Professor Laflamme before the Royal Society at Ottawa last May and now in course of publication. Creuxius (Du Creux), who wrote his history of Canada in Latin, pays some attention to its natural history and enumerates "*arbores plantasque cujuscunque generis quas edere terra sponte solet.*"

To the Jesuits' *Relation,* the *Voyages* of La Houtan, Lafitau's *Moeurs des Sauvages Ameriquains Comparees aux Moeurs des Premiers Temps,* the anthropologist and folklorist may go as to sources of knowledge not to be found elsewhere. Lafitau is, indeed, for North America, the father of comparative mythology. He wrote when opportunities of observing the manners and customs, ceremonies and habits of thought and belief of the wild tribes of Canada were still abundant, and he has dealt learnedly and, so far as was possible in his day, liberally, with his themes. His two volumes are still well worth a careful study. Besides his own experience of savage life, he had derived great benefit from the gathered knowledge of Père Garnier, who had spent no less than sixty years among the Indians, and knew the languages of several Algonquin tribes, the Huron and the five dialects of the Iroquis. Lafitau found that if the study of ancient authors threw light on the usages of the Indians, the latter also enabled him to understand a great deal touching the barbarous races of antiquity, to which he must otherwise have remained a stranger. Charlevoix, besides describing and illustrating a considerable number of new-world plants, gives fruitful attention to American ethnology and the customs of the aborigines. The reports of some of the Intendants, the histories of Boucher, Sagard, Le Clerc, Dollier de Carson and other contemporary records of the old regime contain hints that the student of scientific development may turn to account. Nor would it be wise to ignore the records, both French and English, of far-northern and far-western exploration, missionary, military or commercial, during the same period. The story of the La Verendoye family, with its romance and its tragedy, and those persistent Hudson Bay Co. voyages in search of a northwest passage, with the instructions ever ending in prayer for successful discovery and safe return, have also their scientific significance for those who do not despise the day of small things. Some of the worthiest heroes of science were those who moved in the long, slow march, which, in our more fortunate generation, was to be so wondrously quickened. And the grandest triumphs, from the moral standpoint, belonged to some of those who persevered in the face of failure, knowing that not to them, but to their successors, was the victory destined to fall. The records of scientific progress in America abound in such heroism, and the

rescue from oblivion of some of its forgotten heroes would be not the least reward of the patient inquirer in these unfrequented paths. If what Jules Verne calls *la decouverte de la terre*, that is, the gradual ascertainment of the physical features, extent and habitability of the globe, be worthy of being classed as science (and in what scientific society is not geography recognized?), then what the old regime has contributed to the opening up and civilization of this continent is no scanty share. No less than ten states of the Union, and every province in Canada, save British Columbia, were first occupied by French pioneers, first described by French writers. And in this record of exploration and colonization, extending from 1534 to 1764, we find such names as Cartier, Champlain, La Salle, Duluth, Iberville, Joliette, Marquette, La Mothe, Cadillac and those of many another to whom mankind is deeply indebted. This is the merest outline of what, if a history of science in the new world were undertaken, the inquirer would find helpful and more or less valuable in the records of the northern dominion. On another occasion I hope to give some details from these records as indications of their scientific worth.

BRITISH STONE CIRCLES—IV. SOMERSETSHIRE AND DORSETSHIRE CIRCLES.*

BY A. L. LEWIS, PRESIDENT SHORTHAND SOCIETY, LONDON, ENGLAND.

One of the most interesting groups of circles in England is situated at Stanton Drew, about seven miles south from Bristol. It comprises the remains of three separate circles, two of which have short avenues, a cove, or group of three stones, like those at Abery and Arbelow, a large single stone to the northeast, like the "Friar's Heel" at Stonehenge, and two other stones at a greater distance; and, that these were all parts of one great whole, and were not constructed without reference to each other, is shown by the facts that a line from the "cove" in a direction fifty-four degrees east of north will pass almost exactly through the centre of the great circle to the centre of the smaller circle to the northeast of it, while a line from the centre of the southernmost circle in a direction about twenty degrees east of north will pass almost exactly through the centre of the great circle to an outlying stone called "Hauteville's Quoit."

This latter stone is the first which is encountered on the road from Bristol, and soon after passing it the remains of the great central circle and of the smaller northeastern circle, with the short avenues attached to them, will be seen in a meadow on the other side of the little river Chew, which is crossed by a bridge near by. The northeastern circle is ninety-seven feet in diameter, and consists of nine stones, and there are, besides fragments, eight other stones in the short avenue which goes from it in a direction a little south of east. On the south of this avenue, but not connected with it, another avenue, of which only five stones remain, leads in a southwesterly direction to the great circle, which was about 368 feet in diameter, and of which only twenty-four stones remain; these are, necessarily, a considerable distance from each other, so that it requires a little care to follow the circumference of this circle. The nearest part of the southern circle is 460 feet from the outside of the great circle, and its diameter is 145 feet (which is also about the distance between the circumference of the great circle and that of the northeastern circle); twelve stones of the southern circle remain, but all fallen, and it is cut through by fences, and is, consequently, more difficult to find, and to trace when found, than either of the others. The "cove" is 470 feet, eight degrees north of west, from the circumference of the southern circle, and is not far from the church; it consists of three stones, two upright and one fallen, which form three sides of a square, like the coves of Abery and Arbelow, but it differs from them in facing southeast instead of northeast. Some have thought these stones to have been part of a sepulchral chamber, but they are too thin in proportion to the height of the tallest one (ten feet), and could only have been covered by a very large mound, of which no traces remain; this, however, is a question respecting which the visitor can form his own opinion. If not covered they might have formed a sanctuary open to the rising sun in winter, while the circles were devoted to his worship in summer.

The northeastern circle is better preserved, and is formed of larger stones than the rest of the group, some of the stones composing it being nine feet high, and broad and thick in proportion.

The measurements and compass bearings (true, not magnetic) given here are mostly taken from the beautiful plan made by Mr. Dymond, C.E., F.S.A., and published some years ago in the Journal of the British Archæological Association.

It has been suggested that the avenues are remains of a number of circles concentric with and surrounding the northeastern circle. Mr. Dymond shows pretty conclusively that they were avenues and nothing else, but the visitor may investigate this point for himself.

At Wellow, seven miles south from Bath, and about ten east from Stanton Drew, there is a large tumulus with a long gallery and six small side chambers, built and vaulted with small stones uncemented.

In passing from Somerset to Dorset we find no stone monuments equal to those just described. At Winterbourne Abbas, four or five miles from Dorchester, is a small circle called the "Nine stones," twenty-eight or thirty feet in diameter (not in height as stated, by the Post Office directory), six stones only remain, two of which are six feet high, the others half that size or less. Warne, in his "Ancient Dorset," mentions "a tenth stone which the eye detects just peeping through the long grass on the northeast side."

At Gorwell, on Tennant's Hill, four or five miles beyond Winterbourne Abbas, and about ten southwest from Dorchester, is a ring consisting of eighteen stones or fragments, all prostrate, the largest being eight feet long; the figure which would touch most of them, so far as they are at present uncovered, would be an oval, of which the diameters would respectively be eighty-seven and seventy-eight feet, but they are much overgrown with turf, and, if cleared, it might be found that a circle of from eighty to eighty-two feet in diameter would touch most of their original positions. I was not able to find any outlying stone or other remarkable feature to the northeast of this circle, but there is a thick plantation on that side, which shuts out the view of the surrounding hills, and within which a stone or stones may be buried; there are, however, two outlying stones about 140 feet south from the circle.

At Gorwell, about half a mile southeast from the circle just described, are the remains of a sepulchral chamber and tumulus, with three other stones called the "Grey Mare and Colts," and at Portisham, two miles from Gorwell, is a dolmen called the "Hellstone," which appears to have been inaccurately "restored." There are also remains of a circle or circles at Poswell, six miles southeast from Dorchester, and earthworks nearer that town, known as "Maiden Castle" (a very fine camp), "Poundbury" and "Maumbury Ring."

*I. Abury appeared in No. 529, March 24.
II. Stonehenge appeared in No. 537, May 19.
III. Derbyshire Circles appeared in No. 545, July 14.

SCIENTIFIC RESEARCH WORK IN AMERICA.

BY ALBERT SCHNEIDER, UNIVERSITY OF ILLINOIS, CHAMPAIGN, ILL.

I THINK it quite necessary to point out some of the difficulties encountered in successfully undertaking any scientific research work in America. In the first place we, as a nation, are too practical and short-sighted to make thorough scientists. We are too much engrossed with the present to undertake anything which promises only a probable reward in the distant future. In the second place, we lack sufficient scientific training. Boast as we will, we must admit that Germany, France, England, and even Russia, are a long way in the lead in scholarship. From this lack of training we must content ourselves with going over the ground already gone over by European scholars. Nor is this because of our "infantile" condition. There is no plausible reason why the American mind should not be as ready of comprehension and understanding as any other. We have incipient philosophers who might become equal to or superior to any in the world. The great trouble is that they imagine themselves superior while they are yet in the embryo stage, and as a natural result become fossilized embryos. This is not always the case, but it is true in the majority of cases. Another great drawback is the uncertainty of holding a position when once taken. This deadens interest and absolute.y prevents the possibility of undertaking any work which must of necessity be long continued. In Germany the professor is almost certain of holding his position a life-time if he so desires. As far as his position is concerned he is almost an absolute monarch. The nature of his work is never inquired into by the laity. He is given a position because it is known from his preparation and training that he is fully competent. This enables him to begin a work which may require generations for its completion. Lastly the management and directorship of scientific laboratories and experiment stations is too often placed in the hands of men wholly incompetent, considered from a scholarly standpoint. They can not comprehend the nature of scientific research work nor understand the benefits that might be realized therefrom.

These, in brief, are some of the main difficulties which beset our scientific research work. It is not my purpose to belittle intentionally the work we do or have done. Nor do I believe the prospects for the future to be gloomy and hopeless. America is destined (in time) to lead the world in science and all other branches of learning.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as a proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

TEMPERATURE IN STORMS AND HIGH AREAS.

IN the August number of the *Meteorologische Zeitschrift*, p. 314, Dr. Hann complains that I have "obviously and wholly misunderstood" (*offenbar ganz missverstanden*) a table he has recently published. As I have copied a part of this table in *Science*, April 14, 1893, p. 204, I must ask indulgence to explain matters. My statement is "I give here the temperatures in both maxima andminima during the colder months," the original table indicates that these maxima and minima were at Sonnblick and not at the base. I take pleasure in adding this statement. It seems almost impossible to comprehend this position that Dr. Hann has taken. Are we to understand that these conditions are very different at 3100 m. from those at the same time at sea level? This is exactly what has been repeatedly shown, namely, that the temperature change is about a day ahead at the high station, and the pressure change about half a day behind, and for this reason it is impossible to directly compare pressure and temperature at high stations, but Dr. Hann has strongly combatted this.

However this may be, there is still one other point to be considered. Fortunately, in the original tables there are given the pressures at sea level at the exact times, at which these maxima and minima of pressure occured at Sonnblick. These are 774.5$^{mm.}$ and 754.2^{mm}, respectively, while the base temperatures are 2.°0 C and -0.°8 C., respectively, that is, during the prevalence of very high pressure at sea level the temperature is 2.88 C (5.°0F) higher than during pressures 20.3^{mm}. (0.80 in.) lower. This is contrary to the usual law over the whole temperate regions of the earth and shows a serious error in these investigations.

It seems to me this point is one of the easiest that can be settled in the whole science of meteorology. I hold my position strenuously right here, for this may be a key for solving one of the most serious puzzles that has been found in meteorology since it has made any pretense to being a science. The proposition seems very simple and, in fact, almost trivial, but it is in reality vital. If Dr. Hann insists that his studies are correct, then it devolves upon him to explain this serious contradiction. It would appear that he does see the difficulty and tries to explain it, but I submit, that, in doing so, he has not removed it at all.

H. A. HAZEN.

Washington, D. C., Sept. 11, 1893.

SHARKS IN FRESH WATER.

IN the issue of *Science* for August 25 is a question by Mr. C. H. Ames, which has not been answered. As the subject in question is one of quite general interest, I take pleasure in giving the desired information.

It is well known to ichthyologists that sharks do live in fresh water, and it is remarkable that such forms are representatives of a family whose species are to a large extent pelagic—the Galeids or Carchariids; they belong to a group very generally known as the genus *Carcharias*, but believed by others to be divisible into several genera. Numerous accounts have been published of the occurrence of members of this group in fresh water in various parts of the world; it is sufficient to refer to several readily accessible, viz.: *Nature*, V. 13, pp. 107, 167, 1875, and V. 29, pp. 452, 573, 1884. It is further noteworthy that a shark and a sawfish (*Pristis*) frequently reside together in fresh waters of widely distant regions, as in the Philippine Islands, Australia and Lake Nicaragua.

The existance of a shark in Nicaragua was recorded by Oviedo a few years after the discovery of that country and had frequently been referred to subsequently. It did not receive a published name, however, till 1877, when it was described as *Eulamia nicaraguensis* by Gill and Brantford (Proc. Acad. Nat. Sc. Phila., 1877, p. 191). A few years afterwards the species was again described and figured by Lütken (as *Carcharias nicaraguensis*), and it was stated that the name *Carcharias lacustris* had been proposed for it by Oersted as early as 1848, but never published. (See Vid. Meddelelser fra Naturhist. Forening, Copenhagen, 1879-80, p. 65, etc.)

Further details may be found in the works cited.

THEO. GILL.

Cosmos Club, Washington, Sept. 10.

SHARKS IN LAKE NICARAGUA.

In a letter in the issue of *Science* for August 25, 1893, Mr. C. H. Ames raises the question of the existence of sharks in Lake Nicaragua and seems inclined to attribute to fiction the accounts of their presence which have from time to time been given. The reading of Mr. Ames's letter reminded me of a visit to this lake made by my friend, Mr. Charles W. Richmond, of the U. S. National Museum, and of the narrative he gave me, on his return, of his personal experience with the sharks. Mr. Richmond passed a year in Nicaragua in making natural history collections, and spent considerable time on Lake Nicaragua and the two rivers, the Frio and San Juan, which connect with it on the south; his visit occupied parts of the years 1892 and 1893. He has kindly furnished me some interesting notes on the fresh-water sharks inhabiting Lake Nicaragua and its tributaries, which I venture to present, although a contribution on this subject from the erudite Professor Theodore Gill, which I understand has been sent to *Science*, may render the present remarks supererogatory.

There seems little ground at this time for doubting the existence of sharks in this region. They are mentioned in the works of Belt, Squier, and other writers on Nicaragua and Central America, they are so well known to the inhabitants of the country as to occasion little comment; and they have been recorded and described by several ichthyological writers.

The information gathered by Mr. Richmond and his personal observations tend to indicate that the sharks are quite abundant. Two well-informed men, whose business was the hunting of wadding birds for their plumes, reported to him that they frequently saw sharks, and the captain of one of the lake steamers, a resident of that region for more than thirty years, spoke of sharks as being particularly numerous near Granada, where they remain in the vicinity of the steamer when it is moored there. At San Carlos, two Americans, who made frequent fishing excursions on the lake, mentioned the occurrence of sharks as not unusual.

Mr. Richmond saw a shark in the Rio Frio many miles from its mouth. This river flows into the San Juan just below the lake; on some maps it is incorrectly made to empty into the lake. The example in question swam back and forth near the bank of the river, and did not take alarm even after several balls had been fired at it from a rifle. It was in plain sight, and Mr. Richmond had an excellent opportunity to estimate its length, which appeared to be about five feet. During his voyage down the river in a row boat, his companion, a Mr. Hausen, stopped one morning to fish from a snag in midstream. The fish bit well and he had some excellent sport. Once he attempted to haul in a very desirable fish, and had got it partly out of the water, when a shark seized it and took both fish and hook. The shark came very near to the gentleman and presented its head in uncomfortably close proximity to his foot. Mr. Hausen had made a number of trips up the Rio Frio and had seen sharks there before.

Sharks are found in all parts of the San Juan River, which drains Lake Nicaragua. They are particularly abundant at Castillo Viejo, where the telegraph operator of the canal company whiles away his leisure hours in catching them. Mr. Richmond saw several at this point, doubtless attracted by the flesh of a monkey's skull which he threw into the stream. The Machuca rapids below Castillo make it impossible for salt water to reach that place, and the sharks seen were presumably the same as those infesting the lake.

The shark inhabiting the lake apparently does not reach a large size, as we are accustomed to judge sharks on our coasts. Four or five feet seems to be the average length attained.

The presence of this representative of a typically marine order of fishes in Lake Nicaragua is not the only interesting feature of the fish fauna of this body of water. Mr. Richmond refers to another order of salt-water fishes, closely related to the sharks, which is represented by a large species, the sawfish (*Pristis*). The plume hunters before mentioned reported seeing individuals about three feet in length, and their occurrence was also confirmed by Captain Augustine, of the steamer "Managua" Systematic investigation of the fauna of this lake will doubtless disclose the existence of other animals, appar-

ently out of their element, going to prove that at some remote period the present lake bed was simply a part of the sea bottom, which was thrown up by volcanic action with the supernatant water and its inhabitants.

In the Escondido River, which enters the sea on the Mosquito Coast, Mr. Richmond found sharks as far up as De Rama, sixty-five miles from its mouth. During the dry season, a period of very brief duration, the water is brackish at high tide at this distance. Several sharks, from two to four feet long, were caught here while the water was perfectly fresh. It is not known, however, that these were of the same species as those inhabiting the lake.

HUGH M. SMITH.

U. S. Fish Commission, Washington, D. C.

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